

Product Information Bulletin

PlastiSpan® Insulation and XPS Insulation ASTM C578 Types and Material Properties

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The product specification for expanded polystyrene (EPS) insulation and extruded polystyrene (XPS) insulation in the United States is ASTM C578, “Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.” Since both EPS and XPS insulation products are available with similar material properties for product types identified in C578, the attached table provides a cross-reference to identify available products for comparison.

The notes below provide relevant information for reference when reviewing the material properties values in the following tables:

1. R-values at a mean temperature of 75 °F for EPS and XPS insulation are minimum R-values per inch of thickness as per ASTM C578. **NOTE:** R-values for XPS insulation in C578 do not address long term thermal resistance (LTTR).
2. LTTR is deemed equivalent to the thermal resistance value for a product measured after 5-year storage in a laboratory condition – i.e. the LTTR is equivalent to the aged R-value after 5 years. LTTR is applicable to foam plastic insulation manufactured with blowing agents intended to be retained for greater than 180 days, such as XPS insulation.
3. ASTM C578 states that LTTR for XPS insulation types shall be determined using ASTM C1303, “Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation.” LTTR testing demonstrates reduction in R-value over time so XPS insulation manufacturers may offer a 90% R-value warranty that states actual thermal resistance will not vary by more than ten percent from its published R-value for a specified period such as 10 or 15 years.
4. EPS insulation R-value is not affected by LTTR because it is not manufactured with a blowing agent that is retained within the cellular structure. For this reason, many EPS insulation manufacturers offer a 100% R-value warranty for a minimum of 50 years.
5. Water absorption % by volume values for EPS and XPS insulation types in the table are determined using a laboratory test method that involves submersion under a head of water. The water absorption values are applicable to specific end-use design requirements only to the extent that the end-use conditions would require submersion under a head of water.
6. Water vapour permeance values in the tables are maximum values for 1-inch thick insulation with natural skins intact. Lower values will result for thicker or laminated materials.
7. While an insulation material with a lower vapour permeance characteristic may resist moisture diffusion into it and provide lower water absorption values based upon laboratory test methods, it will also dry more slowly in the event moisture gets into the cellular structure as a result of long term in-service applications. For example, see the following Plasti-Fab Product Information Bulletins (PIBs) available at <http://www.plastifab.com/technical-library/pib-plastifab.html> for additional information on this subject:
 - a. PIB 268 – EPS Insulation R-value Retention Outperforms XPS Insulation after 15 Year Below-Grade Service.
 - b. PIB 297 – Drying Potential of EPS & XPS Insulation Exposed to Environmental Cycling.
 - c. PIB 303 – XPS Insulation In-Situ Water Absorption.

| ASTM C578 PlastiSpan and XPS Insulation Types – Compressive Resistance 25 psi or Less | | | | | | | | | |
|---|---------------------------|------------------------|-----------------------------|---------------------------|-------------|---------------------------|-------------|--|--|
| ASTM C578 Type No. | XI | I | VIII | II | X | IX | IV | | |
| Insulation Type | PlastiSpan XI 0.75 pcf | PlastiSpan 1.00 pcf | PlastiSpan VIII 1.25 pcf | PlastiSpan HD 1.50 pcf | XPS | PlastiSpan 25 2.00 pcf | XPS | | |
| Compressive resistance Minimum, psi | 5.0 | 10.0 | 13.0 | 15.0 | 15.0 | 25.0 | 25.0 | | |
| Thermal resistance Minimum R-value per inch, ft ² -hr ² /BTU | 3.1 | 3.6 | 3.8 | 4.0 | 5.0 | 4.2 | 5.0 | | |
| R-value warranty Minimum % of Original | 50-Year 100% | 50-Year 100% | 50-Year 100% | 50-Year 100% | 10-year 90% | 50-Year 100% | 10-year 90% | | |
| Water vapour permeance Maximum, Perms | 5.0 | 5.0 | 3.5 | 3.5 | 1.5 | 2.5 | 1.5 | | |
| Dimensional stability Maximum % linear change | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | |
| Flexural strength minimum, kPa (psi) | 10 | 25 | 30 | 35 | 40 | 50 | 50 | | |
| Water absorption Maximum % by volume | 4.0 | 4.0 | 3.0 | 3.0 | 0.3 | 2.0 | 0.3 | | |
| Density Minimum, pcf | 0.70 | 0.90 | 1.18 | 1.35 | 1.30 | 1.80 | 1.45 | | |
| Standard Dimensions, in. | | | | | | | | | |
| Length | 96 | 96 | 96 | 96 | 96 | 96 | 96 | | |
| Width | 48 | 48 | 48 | 48 | 48 | 48 | 48 | | |
| Available Thicknesses – Minimum and Maximum, in. | | | | | | | | | |
| Minimum | 1/2 | 1/2 | 1/2 | 1/2 | 1 | 1/2 | 1 | | |
| Maximum | 48 | 48 | 48 | 48 | 4 | 48 | 4 | | |

| ASTM C578 PlastiSpan and XPS Insulation Types – Compressive Resistance Greater Than 25 psi | | | | | | |
|---|---------------------------|-------------|---------------------------|-------------|--|--|
| ASTM C578 Type No. | XIV | VI | XV | VII | | |
| Insulation Type | PlastiSpan 40 2.50 pcf | XPS | PlastiSpan 60 3.00 pcf | XPS | | |
| Compressive resistance Minimum, psi | 40.0 | 40.0 | 60.0 | 60.0 | | |
| Thermal resistance Minimum R-value per inch, ft ² -hr-°F/BTU | 4.3 | 5.0 | 4.3 | 5.0 | | |
| R-value warranty Minimum % of Original | 50-Year 100% | 10-year 90% | 50-Year 100% | 10-year 90% | | |
| Water vapour permeance Maximum, Perms | 2.5 | 1.1 | 2.5 | 1.1 | | |
| Dimensional stability Maximum % linear change | 2.0 | 2.0 | 2.0 | 2.0 | | |
| Flexural strength minimum, kPa (psi) | 60 | 60 | 75 | 75 | | |
| Water absorption Maximum % by volume | 2.0 | 0.3 | 2.0 | 0.3 | | |
| Density Minimum, pcf | 2.40 | 1.80 | 3.00 | 2.20 | | |
| Standard Dimensions, in. | | | | | | |
| Length | 96 | 96 | 96 | 96 | | |
| Width | 24 | 24 | 24 | 24 | | |
| Available Thicknesses – Minimum and Maximum, in. | | | | | | |
| Minimum | 1/2 | 1 | 1/2 | 1 | | |
| Maximum | 48 | 3 | 48 | 3 | | |